2.5
2.2
2.0
2.8
3.2
3.6
4.0
100 mm
1.0
1.1
1.25
1.4
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ABSTRACT

This paper describes the simulator phase of Commonwealth Edison's program for training and licensing operators of nuclear power stations. Topics covered include (1) preparing the students before starting the simulator phase; (2) the simulator schedule and the number of students that can be trained effectively in a class; (3) format and structure of lesson plans and drill guides for the simulator phase; (4) the evaluation tools that must be used to give candidates proper feedback on their progress; and (5) the team instruction approach. In the program described, 97 percent of the technicians being tested obtained licenses. (KC)

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Conducting Effective Simulator Training

By: Kenneth D. Gerling
PWR License Supervisor
Commonwealth Edison

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Conducting Effective Simulator Training

by: Kenneth D. Gerling
PWR License Supervisor
Commonwealth Edison

Good morning Ladies and Gentlemen, as was mentioned before, my name is Ken Gerling from Commonwealth Edison Company out of Chicago and Northern Illinois. I currently hold the position of PWR License Supervisor at our Production Training Center. What that means is I have the responsibility of license training process involving the Byron and Braidwood nuclear station for their initial or replacement licensed operators. This responsibility begins after the stations selection of candidates for the program. Our program, like all of yours, starts with the classroom building blocks of the fundamentals and systems courses. Beginning with the simple concepts and objectives and building on the knowledges presented in the process and hopefully retained into more difficult and complex tasks and objectives.

From the core classroom courses, the candidates progress to the simulator phase of our program which brings me to the topic of my discussion today - "Conducting Effective Simulator Training."

When asked to do this talk, I had the same feeling as when my daughter asked me one of those cutesy jokes from school like "What do you say to God when he sneezes?" or "Where do you tell people in hell to go?" All of us here have a good simulator program, so I hope some of my options are of help to you or generate some thoughts or ideas for a new approach to your simulator training.

The topics I want to discuss today that I feel make our program successful are:

1) Preparation before starting the simulator phase helps the students familiarize themselves with controls.

2) The simulator schedule and the number of students that can be effectively trained in a class.

3) Format and structure of lesson plans and drill guides for the simulator phase.

4) The evaluation tools that must be used at all times to give the candidates the proper feedback on their progress, and last but probably the most effective part of our program is the team instruction approach.

To prepare our students for the simulator phase of the program, we set aside a couple of days of classroom in fundamentals and systems phases where the simulator is scheduled to reenforce concepts learned in the classroom. In these sessions, we break the class into small groups and rotate them between classrooms and the simulator to perform various calculations such as boration or dilution, estimated critical conditions and shutdown margins on the simulator. In other classrooms, we discuss tech spec exercises, transient and accident analysis related to topics or systems already covered, and current event concerns such as inadvertant criticalities. These simulator days allow the students to begin relating classroom knowledges to the "hands on" abilities required to be performed on the simulator. By allowing the classroom students this allotted time on the simulator, it relates areas of the main control board to systems and removes some of the apprehension of the simulator and brings the overwhelming size into some smaller perspective.

To have an effective simulator training program, the schedule must be appropriate and condusive for a learning environment. How long is long enough in the performance areas of the simulator? Where is the best place to break the candidates away for their OJT program? I have seen our initial simulator course go from an eight week program to the current fourteen week program with OJT going from after the simulator to being inserted in between the two phases of our simulator

course. We all understand that the best learning takes place in the daylight hours, however, this is unfair to the candidates if they do not have to perform on the "graveyard" shift since they'll be expected to operate on this shift after they license.

To start out our simulator phase, we bring the students into a running simulator and the instructors give them a turnover. For the first week, they operate the simulator at 100% power, like they are normally going to see the plant, with requests to change load, shift pumps, borate and dilute with the instructors down on the floor monitoring all operations and questioning the students on each evolution. Except for the weeks that the classes are scheduled for dayshift, all classroom sessions are prior to the simulator session where a review of the procedures and evolutions are taught and discussed before performing them on the simulator. The more difficult evolutions or procedures are walked thru by the instructors before starting the simulator scenario for the day. After the demonstration, the class takes a five minute break and returns to a running simulator to take a shift turnover from the instructors. We have found the best schedule for each day is three and half hours of classroom presentation followed by four hours of simulator time with three students per simulator group. We have found that students in a two man group tend to be overwhelmed until late in the program, where as four man groups tend to become cumbersome for the instructors to keep the entire group involved in the objectives to be covered for that day. In addition, limited time on the panels shows up as a weakness later in the final stages of the program but they are all well versed in surveillance performances.

The format of the simulator course and its associated lesson plans and simulator instructor drill guides are a key element to having an effectively conducted program. Again, you must start with a simpler task and procedure and build on that knowledge and familiarity of the panels to more difficult tasks and procedures. Start out with the administrative procedures dealing with how to conduct yourself in the control room and the procedure usage rules and general operating procedures while at power.

After a few days of working together as a group in the simulator, we conduct our Communications, Teamwork, and Diagnostic courses to explain the proper way of conducting operations in the control room. This gives the students the proper direction to follow from the beginning of the simulator course on the way business is to be conducted in the simulator, followed by a demonstration by instructors on the proper technique to be followed on the identification and communication of a problem on the simulator. For a given malfunction, a video tape is made of the group in the early stages of the program and again in the later stages of the program to stress the way the group handled a casualty in the early phases of their training and how their communications, teamwork, and diagnostic abilities have improved.

Regarding our simulator phase classroom training, all our lesson plans contain the entire procedure in the left hand column and background information on the right hand column. This keeps the classroom instructor from having to shift back and forth between two different books and maintains consistency in presentation. Also, we require verbatim compliance to procedures and by discussing each step feel we give the operator/student the overall picture of the procedure and not just the related task done by the procedure.

The simulator instructors drill guide contains the objectives and tasks to be performed for each day and relate to the classroom material presented earlier, along with identified questions on the topic to be asked. We also require our drill guides be followed verbatim to ensure all students complete the required performance objectives for that day. If a class has completed the daily requirements, the instructor can rerun poorly or unsatisfactorily performed evolutions conducted earlier in the program.

The evaluation tools used in todays programs far exceed those of old by keeping the students not only informed of his/her academic progress, but performance progress as well. The evaluation tools must be as instructor friendly as possible while giving the student feedback on his performance on all areas or topics critiqued in the scenario.

For the academic progress, we all still use the written exam, but for the simulator program we utilize the NRC's four section exam approach with a theory, systems, procedure, and administrative section. During the first part of the simulator phase, we weight the exam heavier on procedures and administrative requirements but equalize the sections on the last part of the simulator phase.

All our daily evaluations are pre-typed with the objectives or tasks to be performed for that day or scenario to allow the instructor more time to evaluate the students rather than writting the objectives or tasks evaluated. These daily evaluation sheets are then used by the instructors in their post critique of the days evolutions. The daily evaluations are used later in the week to create a evaluation which is reviewed and signed by the student and sent to the appropriate station Training Supervisor for a performance feedback or progression check. All performance items identified or evaluated by the instructors as unsatisfactory must be performed again until satisfactory completion of the task is achieved.

We also conduct three different mock audits by instructors and station training personnel to evaluate the progress of the candidates under the stress of unfamiliar surrounding and people, to better prepare the students for the upcoming certification and NRC examination process.

The use of video taping is a very powerful evaluation tool, not only during the mock audits to discuss problems noted, but frequently during the program to provide immediate feedback that can be evaluated by the group alone and later with the instructor. With the video tape, you can replay and explain problem areas, reenforce and stress teamwork and diagnostic errors.

Lastly, but most important for the success of our simulator program in effectively conducting the course is the team instruction technique. In the team instruction concept, I use three instructors per simulator class or shift. With a six man class, I then have a student to instructor ratio of 2:1 but realistically for the simulator this ratio is 1½:1.

The team consists of one senior instructor who has previously conducted three or four classes and now as the senior instructor covers the simulator all eight hours of the shift to ensure consistency in presention. Along with the senior instructor is the group instructor, who conducts the classroom material prior to simulator and then rotates into the simulator with his group to assist and instruct in the simulator with the senior instructor. This technique has helped with all the paperwork requirements and gives the students two people they can use for feedback and help in the explaination of difficult tasks or procedures. The senior instructor grades all written exams taken by both simulator groups to provide consistency in grading of the exams and can answer any questions that arise that may be in the gray area of interpretation. Using this approach during the first few weeks of simulator training, the class can progress along more smoothly due to the added floor coverage by both instructors, demostrations can be done to illustrate the proper method of implementing the procedure and later in the program evaluations and critiques are more thorough with two sets of watchful, experienced eyes. By identifying what performances each instructor is to evaluate, one instructor on the floor can evaluate knowledges by questioning the students and evaluating implementation of procedures and diagnostic capabilities while the booth instructor can evaluate communication and team performance along with input on other observed evolutions or tasks.

As I explained at the beginning of my discussion to conduct effective simulator training, you want to prepare the students for the first day they walk into the simulator by integrating classroom lectures to areas where the performance will take place on the simulator to remove overpowering size of the task ahead of them. Make the simulator schedule as condusive as possible for the learning environment and keep the class size at a minimum level. Create a program with lesson plans that are not a hassle for the instructor with all the information available to minimize interpertation to the class. Create and use evaluation tools to help the instructor give as much feedback as possible to the student so he/she knows how his/her

progression is as compared to the rest of the class. The team instructor concept is the most important of all because of the numerous requirements of todays training standard to properly evaluate and feedback to the students the current information needed to satisfy their needs and get the maximum out of their potential you must raise the standard to which they must perform. Two set of eyes evaluating their performance means less unseen errors and less problems taken back to the plant.

Our program is effective but not perfect, in mass numbers we sent 48 initial candidates up for NRC exams in 1987 and passed 47 for a success rate of 97.9%. Don't allow your program to become stagnant and resistant to change, keeps an open mind and listen to the feedback of the candidates, instructors, and the industry. It's the only way to stay abreast of todays changing criteria.

Thank you

SIMULATOR SCHEDULE
GROUP: 83-1.1A
INSTRUCTOR: COON
STUDENTS: JENSON/PETERSON/LYON

MON	TUES	WED	THURS	FRI	SAT	SUN
4/11	4/12	4/13	4/14	4/15	4/16	4/17
2	2	2	2	2	OFF	OFF
MON	TUES	WED	THURS	FRI	SAT	SUN
4/18	4/19	4/20	4/21	4/22	4/23	4/24
OFF	OFF	13	13	13	13	13
MON	TUES	WED	THURS	FRI	SAT	SUN
4/25	4/26	4/27	4/28	4/29	4/30	5/1
13	13	OFF	OFF	14	14	14
MON	TUES	WED	THURS	FRI	SAT	SUN
5/2	5/3	5/4	5/5	5/6	5/7	5/8
14	14	14	14	14	OFF	OFF
MON	TUES	WED	THURS	FRI	SAT	SUN
5/9	5/10	5/11	5/12	5/13	5/14	5/15
MCD	MCD	MCD	MCD	MCD		
2	2	2	2	2	OFF	OFF
				ORAL EX		
MON	TUES	WED	THURS	FRI	SAT	SUN
5/16	5/17	5/18	5/19	5/20	5/21	5/22
13	13	13	13	13	OFF	OFF
				AUDIT		
MON	TUES	WED	THURS	FRI	SAT	SUN
5/23	5/24	5/25	5/26	5/27	5/28	5/29
14	14	14	14	14	OFF	OFF
MON	TUES	WED	THURS	FRI	SAT	SUN
5/30	5/31	6/1	6/2	6/3	6/4	6/5
14	14	14	14	14		

SHIFT LEGEND: 1 = 00-08, 2 = 08-16, 3 = 16-24, 13 = 12-20, 14 = 20-04

SIMULATOR SCHEDULE
GROUP: 88-1.1A
INSTRUCTOR: COON
STUDENTS: JENSEN/PETERSON/LYON

MON	TUES	WED	THURS	FRI	SAT	SUN
9/5	9/6	9/7	9/8	9/9	9/10	9/11
OJT	OJT	14	1 GSEP	1 GSEP	11	11
MON	TUES	WED	THURS	FRI	SAT	SUN
9/12	9/13	9/14	9/15	9/16	9/17	9/18
OFF	OFF	13	13 AUDIT	13	13	13
MON	TUES	WED	THURS	FRI	SAT	SUN
9/19	9/20	9/21	9/22	9/23	9/24	9/25
13	13	13	OFF	OFF	11	11
MON	TUES	WED	THURS	FRI	SAT	SUN
9/26	9/27	9/28	9/29	9/30	10/1	10/2
14	14	14	14	14	OFF	OFF
MON	TUES	WED	THURS	FRI	SAT	SUN
10/3	10/4	10/5	10/6	10/7	10/8	10/9
2	2 study	2 week	2	2	OFF	OFF
MON	TUES	WED	THURS	FRI	SAT	SUN
10/10	10/11 W	10/12 W	10/13 W	10/14 W	10/15	10/16
2 STUDY	2 WRITTEN	2 ORAL EXAM	2 DEMO	2 DEMO		

SHIFT LEGEND: 1 = 00-08, 2 = 08-16, 3 = 16-24, 13 = 12-20, 11 = 20-01
10/1 THRU 10/9 IS STUDY WEEK AT PTC

ATTACHMENT B

DAILY PERFORMANCE EVALUATION

EVALUATION FOR DAY NO. 9a INSTRUCTOR: ____________

NAME: ____________ CLASS NUMBER: ____________

DATE: ________ SHIFT WORKED: _____ SHIFT POSITION: SRO

RATING: S=SATISFACTORY — EXCELLENT TO GOOD
M=MARGINAL — FAIR WITH AN UNDERSTANDING
U=UNSATISFACTORY — INCORRECT & INCOMPLETE

EVOLUTIONS EVALUATED [* = REQUIRES EVALUATION]	KNOWLEDGE LEVEL	PERFORMANCE LEVEL
Supervise plant startup		
*Supervise the use of BGP's		
Direct shift personnel during major evolutions		
*Perform reactor plant startup		
*Startup the turbine to rated speed		
Synchronize generator to the grid		
Receive and give switchyard switching orders		

369M/109M/3 8/85

ABNORMAL OPERATIONS	RECOG	COMMUN	ACTIONS IMMED	ACTIONS SUBSQ	INTEGRATED RESPONSE

TECH SPEC APPLICATIONS: RATING:

CONTROL ROOM LEADERSHIP (SRO ONLY): RATING

COMMENTS:

ATTACHMENT B

DAILY PERFORMANCE EVALUATION

EVALUATION FOR DAY NO. 9a		INSTRUCTOR:	
NAME:		CLASS NUMBER:	
DATE:	SHIFT WORKED:	SHIFT POSITION: RO	
RATING: S-SATISFACTORY	EXCELLENT TO GOOD		
M-MARGINAL	FAIR WITH AN UNDERSTANDING		
U-UNSATISFACTORY	INCORRECT & INCOMPLETE		

EVOLUTIONS EVALUATED [* = REQUIRES EVALUATION]	KNOWLEDGE LEVEL	PERFORMANCE LEVEL
*Perform a reactor plant startup		
Monitor the rod position indication system		
*Operate CEDS to take the reactor critical		
Establish initial conditions at OPMD5J for S/U		
*Perform RCS minimum temp for criticality surveillance		
Monitor the RCS		
*Startup the turbine to rated speed		

369H/109H/5 8/85

ABNORMAL OPERATIONS	RECOG	COMMUN	ACTIONS IMMED	ACTIONS SUBSQ	INTEGRATED RESPONSE

TECH SPEC APPLICATIONS: RATING:

CONTROL ROOM LEADERSHIP (SRO ONLY): RATING

COMMENTS:

369M/109M/6 8/85

ATTACHMENT B

DAILY PERFORMANCE EVALUATION

EVALUATION FOR DAY NO. 9a INSTRUCTOR: ____________
NAME: ____________ CLASS NUMBER: ____________
DATE: ________ SHIFT WORKED: _____ SHIFT POSITION: BOP
RATING: S=SATISFACTORY EXCELLENT TO GOOD
M=MARGINAL FAIR WITH AN UNDERSTANDING
U=UNSATISFACTORY INCORRECT & INCOMPLETE

EVOLUTIONS EVALUATED [* = REQUIRES EVALUATION]	KNOWLEDGE LEVEL	PERFORMANCE LEVEL
*Operate the scaler timer		
*Operate the audio count rate drawer		
*Perform a reactor plant startup		
*Startup the turbine to rated speed		
*Perform generator excitation		
*Synchronize the turbine to the grid		
*Increase the load on the generator		
Monitor the turbine generator		
Adjust turbine load limits		
*Operate the generator voltage regulator		

ABNORMAL OPERATIONS	RECOG	COMMUN	ACTIONS IMMED	ACTIONS SUBSQ	INTEGRATED RESPONSE

TECH SPEC APPLICATIONS: RATING:

CONTROL ROOM LEADERSHIP (SRO ONLY): RATING

COMMENTS:

ATTACHMENT D

PERIODIC STUDENT EVALUATION

NAME: _____ STATION: _____

CLASS NUMBER: _____ DATES: _____ INSTRUCTOR: _____

STRENGTHS
NOTED: _____

AREAS FOR IMPROVEMENT: _____

COMMENTS: _____

_____	_____	_____
STUDENT SIGNATURE	LEAD INSTRUCTOR, SIMULATOR	INSTRUCTOR SIGNATURE

342M/106M/40 8/87

POST EVOLUTION CRITIQUE FORM

I.) Receive student feedback and self-evaluation comments on team and individual performance.

Comments:_____

_____

_____

_____

_____

_____

_____

II.) Event Critique:

a.) Evolution: Continue a Reactor Coolant System heatup to Hot standby (Mode 3) and draw a bubble in the Pressurizer in accordance with GP 100-1..

Topical Discussion	Questions
1.) Drawing a Bubble	
2.) Starting RCP's	
3.) Temperature Control	
4.) Heatup Rate	
5.) ECCS Operability	

b.) Abnormal Operation: None Scheduled

Topical Discussion	Question